Supporting Information

High-aspect-ratio single-crystalline $(Hf_xZr_{(1-x)})B_2$ micron-rods: Low-temperature, highly-efficient synthesis and oriented growth mechanism

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Figure and Table captions

Figure S1. Histograms of (a, c, e) length and (b, d, f) aspect-ratio of $(Hf_xZr_{(1-x)})B_2$ (x = 0.25, 0.50 and 0.75) particles in the samples (H1Z3-11, H1Z1-11 and H3Z1-11) synthesized by MSM-BCTR method at 1100 °C/20 min, respectively.

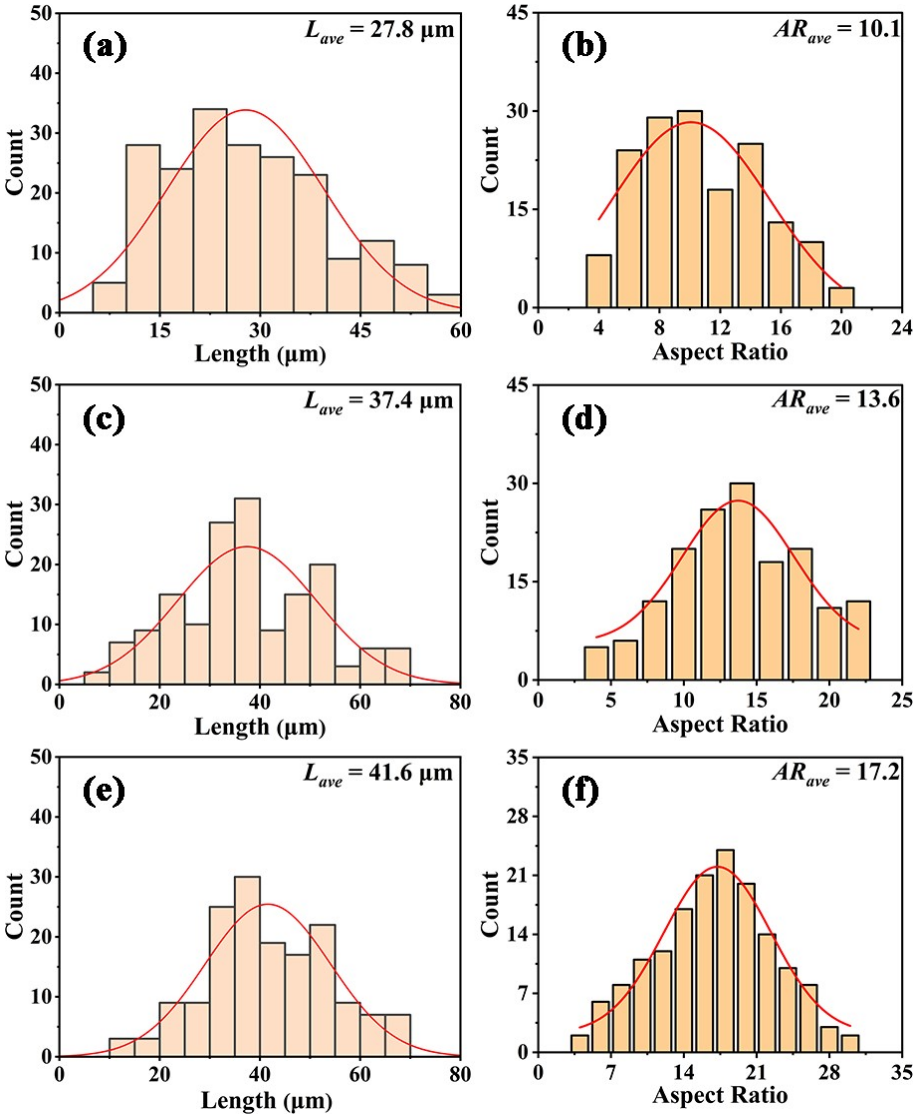
Figure S2. (a, c, d) Low-resolution TEM images and (b, d, f) EDS-dotting spectra of the rod-like $(Hf_xZr_{(1-x)})B_2$ crystals (x = 0.25, 0.50 and 0.75) synthesized by MSM-BCTR method.

Table S1 EDS-dotting results of the $(Hf_xZr_{(1-x)})B_2$ crystals presented by Figure S2(a,c,e)

Figure S3. SEM images of samples prepared at 1100 °C/ 20 min by either (a) microwave-assisted or (b) molten-salt-assisted BCTR method.

Figure S4. SEM image of the sample (H1Z1-14-C) synthesized by molten-salt-assisted BCTR method at 1400 °C for 180 min, with B_4C as reducing agent.

Table S2 Batch compositions and processing conditions of contrast MSM-BCTR experiments with different types of reducing agents.



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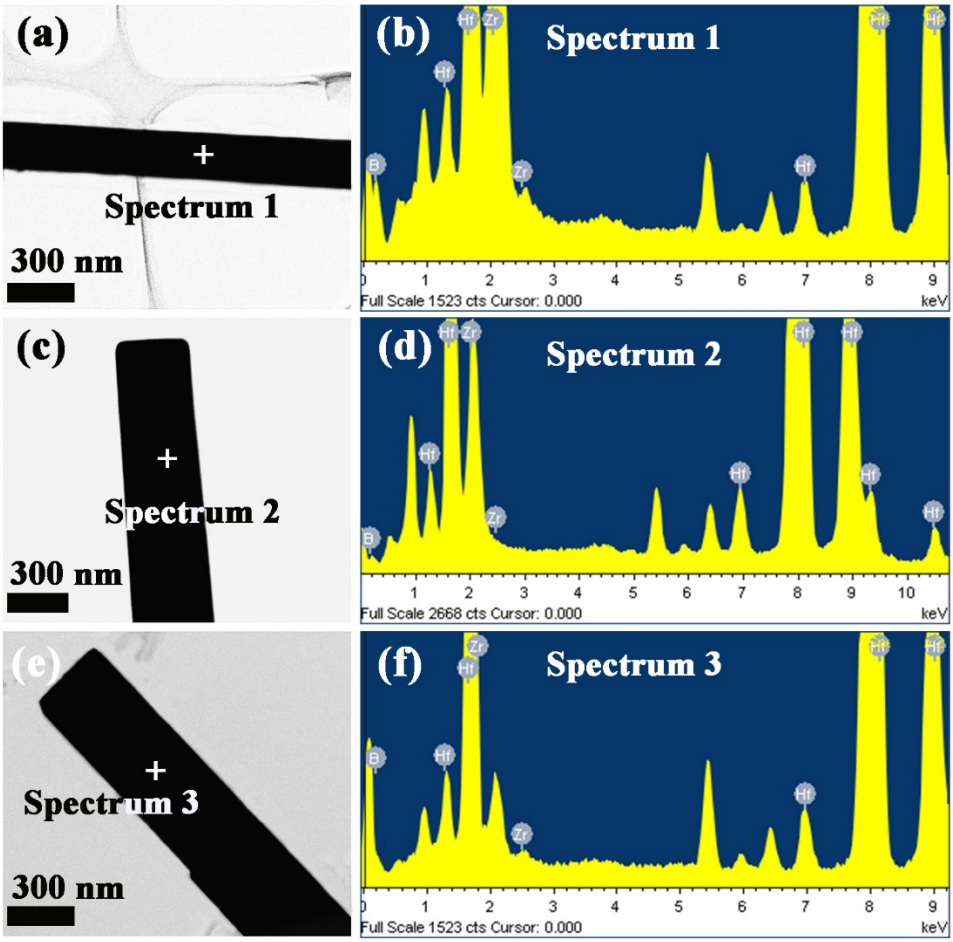

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Table S1 EDS-dotting results of the $(Hf_xZr_{(1-x)})B_2$ crystals presented by Figure S2(a,c,e)

Sample No.	Content (at.%)		
	Hf	Zr	B
H1Z3-11	13.2	37.5	49.3
H1Z1-11	25.4	24.7	49.9
H3Z1-11	38.7	12.8	48.5

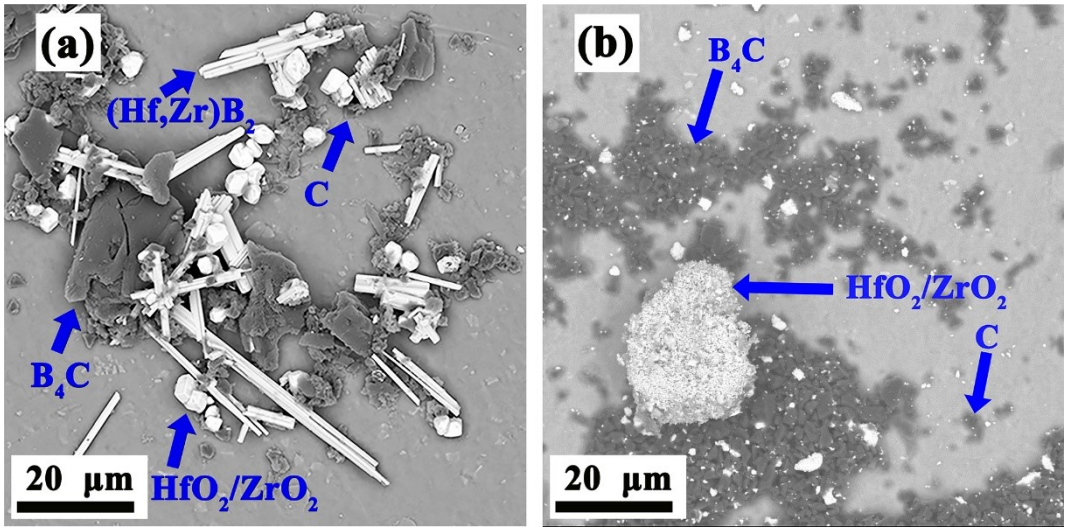

Figure S3. SEM images of samples (H1Z1-11-M and H1Z1-11-C) prepared at 1100 °C/ 20 min by either (a) microwave-assisted or (b) molten-salt-assisted BCTR method.

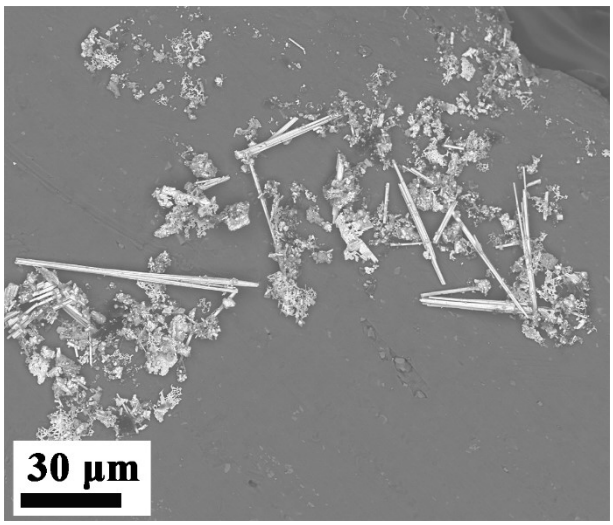

Figure S4. SEM image of the sample (H1Z1-14-C) synthesized by molten-salt-assisted BCTR method at 1400 °C for 180 min, with B_4C as reducing agent.

Table S2. Batch compositions and processing conditions of contrast MSM-BCTR experiments with different types of reducing agents.

Sample No.	Batch composition	Salt medium	Weight ratio between salt medium and reactants	Heating mode	Temperature (°C)	Soaking time (min)
S1	$n(ZrO_2)$:$n(HfO_2)$: n(B)=1.0:1.0:6.7	NaCl/KCl	2.0	MWH*,[a]	1100	20
S2	$n(ZrO_2)$:$n(HfO_2)$: n(B):n(C)= 1.0:1.0:6.7:3.0	NaCl/KCl	2.0	MWH	1100	20

*,[a]MWH denote microwave heating condition.